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UK CL (Edition J) G4T, G4V

(54) Use of credit cards with a reusable phone card

(57) A credit card is used to charge a user for updating his/her reusable phone cards' credit. The user may update, (increase), the reusable phone cards' credit without initiating a telephone call. The dynamic updating, (during the telephone call), of the reusable phone cards' credit is also undertaken. The integrated system neither requires a coin slot nor the physical use of the credit cards to charge the user. The technique used for updating the reusable phone cards' credit is to dial a code followed by the credit card number and a personal secret code number and finally the amount by which the phone cards' credit is to be increased.

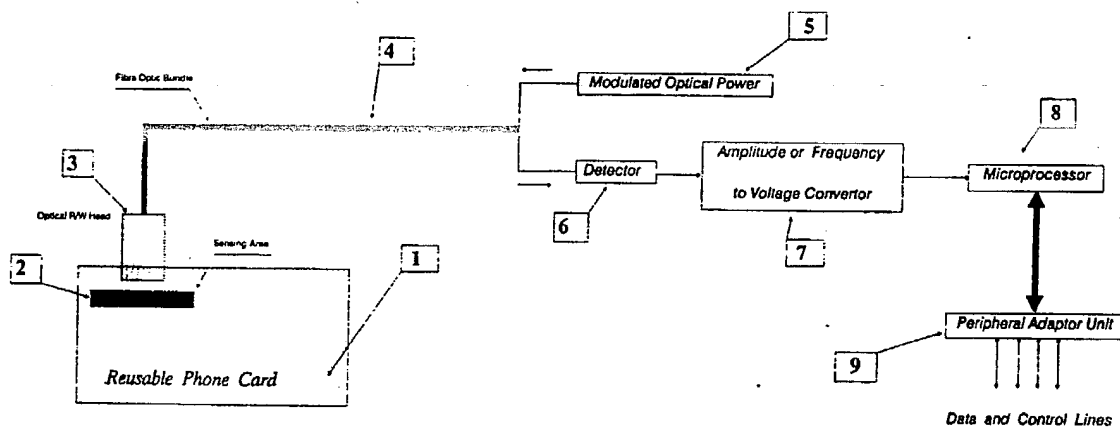


Figure 1. The Schematic Diagram of the Configuration

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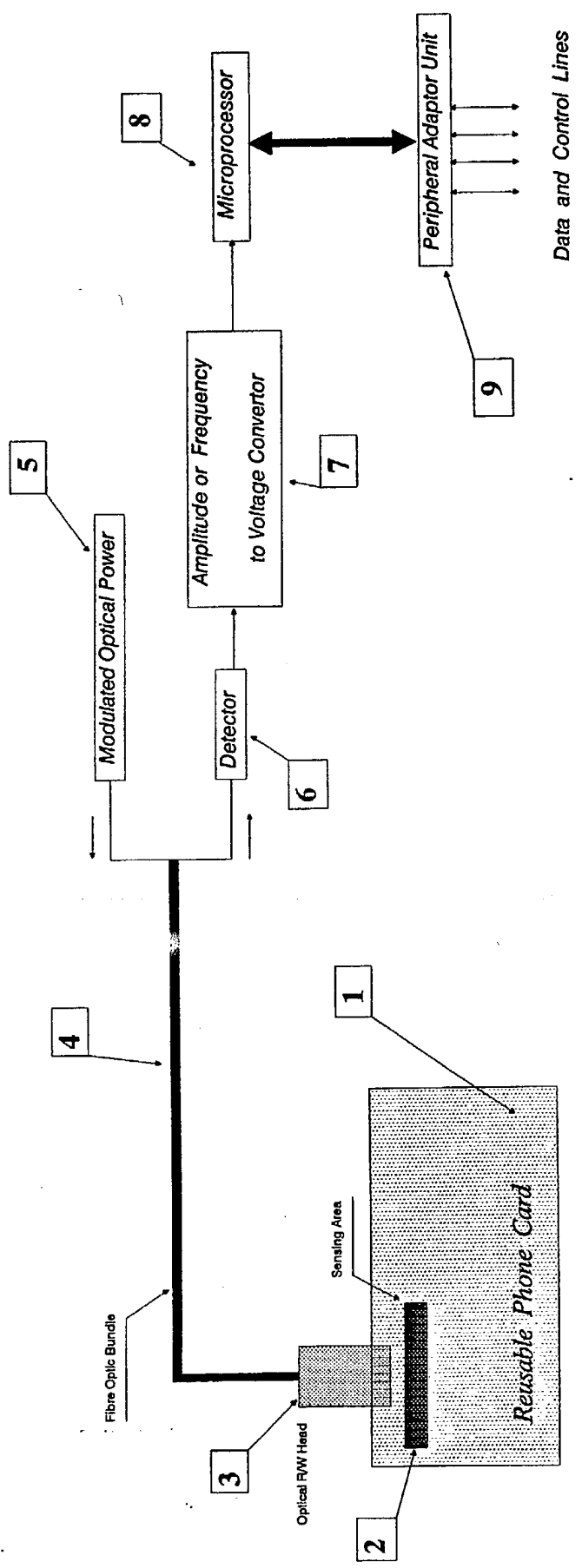


Figure 1. The Schematic Diagram of the Configuration

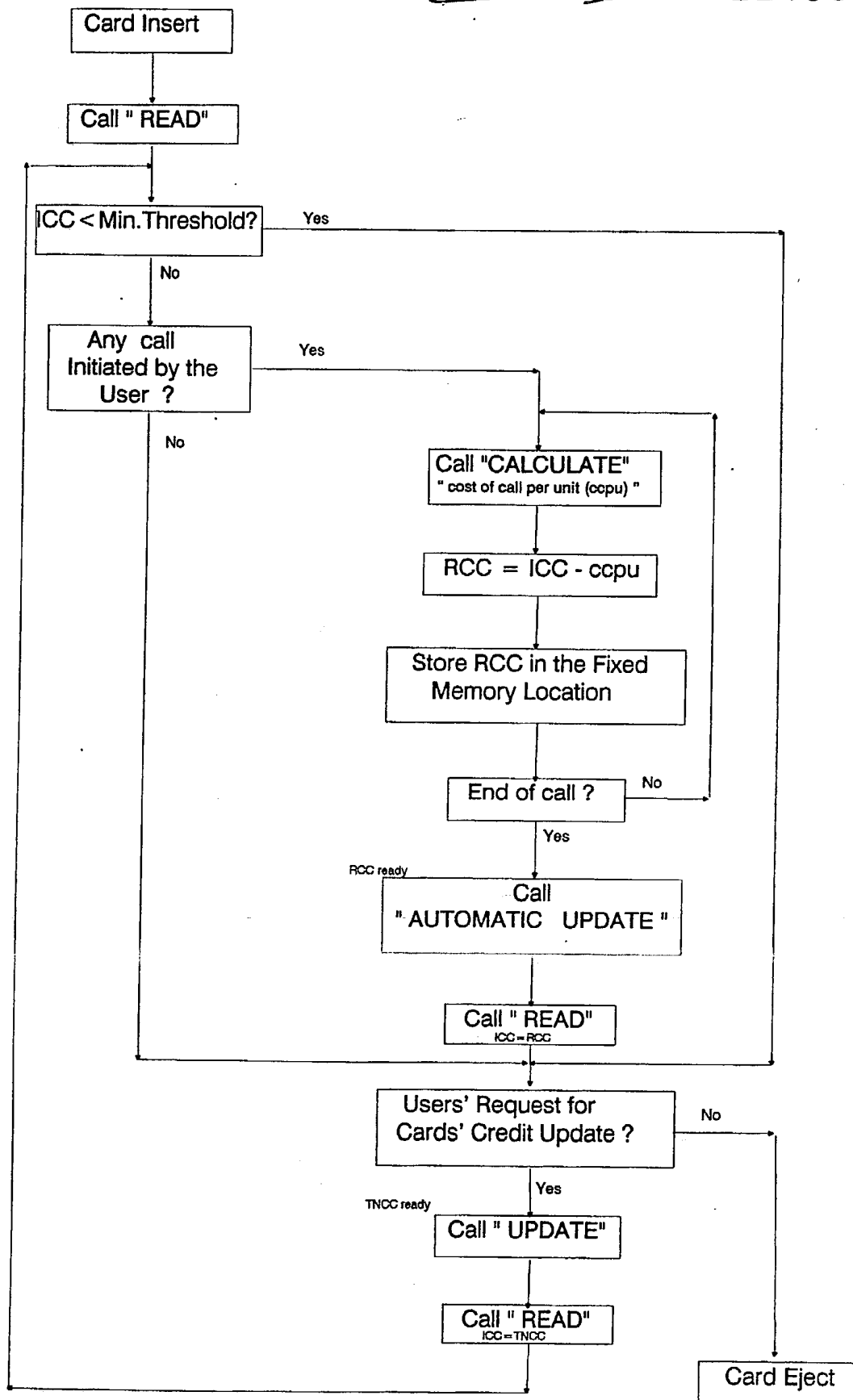


Figure 2. The Logical Flow of the Process

**A Novel Use of Credit Cards with a Reusable Phone Card
in a Coin-Free Cardphone**

Phone cards have been introduced for the past several years facilitating a coin-free operated payphone (cardphone), easy to use and being immune from vandalism. In spite of the wide use of these cards, they become out of use on expiry. However, manufacturers of the available phone cards have thought of producing them in different forms, e.g. wedding or birthday presents, yielding to a better use of these cards so that people may tend to keep it on expiry.

According to the present invention, there is provided a novel implementation for the use of credit cards to charge the user for updating his/her reusable phone cards' credit, (mentioned as "cards' credit" onwards). All integrated in a coin-free cardphone. This is based on updating the cards' credit with no need for a coin slot to be mounted on the available cardphones maintaining their features and advantages. Action of updating is via sliding an optical read/write head, in micro steps, aligned along a sensing area. Charging the user for his/her request to update the cards' credit is neither by using "cash-coins" nor by using the credit card physically. Instead, the invention provides a better configuration to facilitate the use of credit cards, (ACCESS, VISA, ...etc.), for charging the user through a software task under the control of the microprocessor

unit. Thus, the user will not use the credit card physically. Other software tasks carry out the necessary functions such as deducting units during a telephone call, (mentioned as "call" onwards), i.e. when using the reusable phone card normally, controlling the updating procedures, the micro-step sliding motion of the read/write head, and all other operations necessary yielding to an integrated functional system. The use of the current size of phone cards is vital while using major parts of the payphone mechanism available, is seen to be of great importance. Other basic hardware circuitry such as the memory unit, power supply, clock generator ...etc., necessary to complement the microprocessor unit in a microcomputer configuration are not shown as they are considered standard circuitry.

The schematic diagram of the configuration concerned, Figure 1, shows the modulated optical source 5 and optical read/write head 3 attached to the sensing area 2 on the reusable phone card 1. Optical signals are carried out via a fibre optic bundle 4. Figure 1 also shows some other functional block diagrams of the related circuitry complementing the operation of the new sub-system such as the detector 6, amplitude/frequency to voltage conversion 7, a microprocessor unit 8 and a peripheral adaptor unit 9.

As definitions:-

a. The "read" operation is always initiated automatically.

b. The "*update*" procedure is only initiated by the user on request to increase the cards' credit.

c. The "*automatic update*" procedure is initiated automatically after the end of a call in order to decrease the cards' credit.

Further, there is a unique value of the cards' credit which is stored in a corresponding unique *fixed memory location*. This value can be a result of either one of the following actions.

The first action is due to initiating a "*read*" operation automatically as the reusable phone card is inserted. This is simply defined as the Initial Cards' Credit (ICC).

The second action is due to the "*calculate*" procedure during the call, whereby the cost of the call per unit (ccpu) is deducted from the ICC. This will result a unique value corresponding to the remaining cards' credit at the end of the call. It is defined as the Remaining Cards' Credit (RCC).

The third action is due to an "*update*" procedure, initiated by the user, to increase the cards' credit by an amount (equivalent to cash money). This amount is added to the ICC resulting a unique value defined as the Total New Cards' Credit (TNCC).

The logical flow of the process is shown as a form of a flow chart describing a group of linked software tasks, Figure 2. As the reusable phone card is inserted, a "read" operation is initiated (automatically). The microprocessor unit checks for the "minimum threshold" of the Initial Cards' Credit (ICC). If the ICC is less than the preset minimum threshold, (10 pence in UK), the cards' credit is regarded as (No Credit). Thus the software checks if the user requests an update, (increase), of the cards' credit as no call can be initiated with (No Credit) on the reusable phone card. If no request is acknowledged at this stage, then the card is ejected. Otherwise, the user will request an update of the cards' credit, hence an "update" procedure is initiated with a known TNCC value. At the end of this update, the "read" operation is initiated again to check for the minimum threshold, (i.e. at the end of this "read" operation, ICC = TNCC). If any credit greater than or equal to the "minimum threshold" exists, it is stored in the fixed memory location overwriting any previous value. At this stage, the user may wish to initiate a call, increase the cards' credit again or eject the card. If neither a call is initiated nor another update is requested, the reusable phone card is ejected. If another "update" is requested by the user, the description above is repeated.

A call is initiated if and only if ICC is greater than or equal to the "minimum threshold". If the call is acknowledged, the "calculate" procedure is initiated to calculate the cost of the call per unit, (ccpu), depending on the call rate and time. This

software also deducts the calculated (ccpu) from the stored ICC and the result of this deduction is stored back as the **Remaining Cards' Credit (RCC)**, overwriting the previous ICC value. It is also displayed to the user. The deduction and display operations occur "dynamically" as they are performed during the call. When the microprocessor unit detects the "end" of the call, by simply setting a flag for the handset in rest position, the RCC value is the correct cards' credit of which the reusable phone card must hold. Since it is stored in the *fixed memory location*, the cards' credit is decreased by initiating the "automatic update" procedure. At the end of this "automatic update" procedure, a "read" operation is initiated to verify the ICC value as being the RCC value, (i.e. at the end of this "read" operation, $ICC = RCC$). It is evident that although the user is informed by the amount of the cards' credit dynamically, (during the call), the actual updating of the remaining cards' credit is true only after the "end" of the call. This is due to the technique used in the updating procedure (explained later). After the reusable phone card is updated at the "end" of the call, the user still has the chance to initiate another call (if ICC is greater than or equal to the "minimum threshold"), increase the remaining credit or eject the card. The latter is the status in which neither another call nor another update is requested.

As mentioned earlier, the "update" procedure is increasing the cards' credit as requested by the user while the "automatic update" procedure is decreasing the cards'

credit automatically at the end of a call. The only other difference, in terms of terminology, is that the "*automatic update*" requires the RCC value to decrease the cards' credit while the "*update*" procedure requires the TNCC value to increase the cards' credit.

The following paragraphs explain the "*read*" operation, "*calculate*", "*update*" and "*automatic update*" procedures as mentioned in Figure 2 being "Call READ", "Call CALCULATE", "Call UPDATE", and "Call AUTOMATIC UPDATE" respectively.

A "*read*" operation is performed as follows. A modulated laser (or other source of) optical input power 5, Figure 1, will provide the modulated optical input signal via the fibre optic bundle 4 in which when reflected on the sensing area 2 of the reusable phone card 1, it will produce an optical pattern which corresponds to the credit remaining on the reusable phone card 1, (either ICC as the card is inserted, RCC at the end of an "*update*" procedure or TNCC at the end of an "*automatic update*" procedure). The reflected optical signal (in a form of an optical pattern) is fed into the detector circuitry 6 via the fibre optic bundle 4 and depending on the type of modulation in 5, the circuitry in 7 is determined to be either amplitude or frequency to voltage conversion. This will generate a unique electronic signal as the read/write head 3 is moving, (sliding), along the sensing area 2. This electronic signal, (in a form of an electronic pattern), is interfaced to the microprocessor unit 8, (interfacing circuitry not

shown as being assumed standard), interpreted as the amount of the Initial Cards' Credit (ICC) and is stored in the *fixed memory location* replacing any previous value. The movement of the read/write head 3 (also carried out under software control), is effectively sliding the head along the sensing area 2 separated by a micro air cushion. This motion is carried out in microsteps such that the time per step is greater than the time required to read one sample per step.

The "*calculate*" operation takes place during the call and is performed per unit of the cost dynamically. It is mainly executing simple arithmetic routines to calculate the cost of the call per unit (ccpu) depending on the call rate and time. The ccpu is deducted from the value stored in the *fixed memory location*, (ICC), to get the RCC value. Finally, the RCC value at each unit is stored back in the *fixed memory location* such that at the "end" of a call, the RCC value is the correct cards' credit. Note that this value is also displayed dynamically during the call and at the "end" of it.

The "*update*" procedure involves three stages. The first stage is carried out by the user executing the following steps:-

Step 1: Dial a three-digit number similar to those enquiring public services such as an ambulance, operator, police, fire ... etc. No initial cards' credit is required, (ICC=0), to get this number.

Step 2: Dial the credit card, (ACCESS, VISA ... etc.), number and then follow it by dialing the secret code, (personal number), known by the credit card holder only.

Step 3: Dial the amount, (equivalent to cash money), of which the cards' credit is to be increased.

After carrying out the normal checking procedures for the credit card ownership, the value dialed in step 3 above is the value of which the cards' credit is to be increased. This value is added to the value stored in the *fixed memory location* (either ICC as a result of a "read" operation, as the reusable phone card is inserted, or RCC after an "automatic update" procedure at the "end" of the call). At the end of this stage, the amount dialed in step 3 above plus the ICC results the "Total New Cards' Credit" (TNCC).

The second stage is to erase the entire cards' credit before "writing" the TNCC value. The "erasing" technique can be implemented using one of the principle already developed. In order to do this, it is required to use a crystalline material for the sensing area 2 only, Figure 1. Heating this area to just below its melting point will force this area to gain back its crystallized properties, (oven not shown). This will erase any previous marks on the sensing area 2.

The third and final stage is the "write" action. It involves the electronic encoding of the TNCC value, (given at the end of stage 1, step 3), to generate a unique electronic pattern. This electronic pattern will interfere into the optical modulation circuitry 5, Figure 1, to generate the matching optical pattern. As the read/write head 3 will again slide along the sensing area 2 in micro steps, the sensing area 2 is burnt by the optical source 5 yielding to a combination of burnt micro slices (marks) being a unique code (pattern) corresponding to the TNCC value. It is obvious that the time per micro step is greater than the time required to burn one slice.

It is important to note that stages 1 to 3 concern the "update" procedure, (which is requested by the user to increase the cards' credit). The "automatic update" procedure, (as being initiated automatically at the "end" of a call), involves stages 2 and 3 only where the RCC value is concerned instead of the TNCC value.

Note that stage 1, steps 1 and 2 above are very similar, (in terms of verifying the credit cards' ownership), to the operation of the *Credit Card Operated Payphones* available at major international airports where the possibility of using credit cards instead of local cash coins is evident.

Further, stage 1, steps 1 to 3 are executed by the microprocessor unit either one step at a time or stacked in the memory, (temporarily), and when correct (ready), the user can ask for execution while displaying each number in turn. An additional facility can

be implemented to enable the user to correct the "data" dialed through the concerned mentioned steps, if necessary. However, charging the user for the amount of cash required to update his/her reusable phone cards' credit (cards' credit), does not require inserting the credit card (ACCESS, VISA ...etc.), i.e. no physical use of credit cards takes place. Instead, the invention "logically" implements the use of credit cards for this purpose.

Other arrangements are necessary similar to those required to operate the *Credit Card Operated Payphones* and the *automatic cash point machines*, both technically and financially. These will include :-

A. Appropriate connections through telephone exchanges, (switchboards), should be available for the following services :-

- To arrange for the availability of a "number" similiar to that for public services, (e.g. operator, police, fire...etc.). Dialing this number should require no credit on the reusable phone card.

- To allow the exchange, (switchboard), to execute the necessary steps similiar to those required by the *automatic cash point machines* whereby the amount cashed is

registered as withdrawn from the customer's, (user), bank account. This will require dialing the credit card number and the secret personal code, (stage 1, step 2 above). Finally, the user should dial the amount of money equivalent to the units required to increase the reusable phone card credit, (stage 1, step 3 above). This will ensure the proper implementation of the use of credit cards for this purpose since it requires the knowledge of the credit card number and the secret personal number, e.g. four digits in UK, in order to get through banking procedures.

B. Financial arrangements should also be available to consider the value dialed in stage 1, step 3, described earlier, as withdrawn cash money from the users' personal account, (similar to those of the *Credit Card Operated Payphones*)

CLAIMS

1. The implementation of the technique used to update the reusable phone cards' credit, (mentioned in the "*update*" and "*automatic update*" procedures).
2. The novel "logical" use of credit cards, (ACCESS, VISA, ...etc.), to charge the user for updating the reusable phone cards' credit. No physical use of these credit cards is required.
3. The provision of a coin-free cardphone, including claims 1 and 2, maintaining the features and advantages of the available cardphones. Thus, according to this invention, inspite of updating the reusable phone cards' credit, there is no need for a coin slot to be mounted on the available cardphones to charge the user.